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Indian Standard
SPECIFICATION FOR
GENERAL PURPOSE MAXIMUM AND
MINIMUM THERMOMETERS

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SPECIFICATION FOR GENERAL PURPOSE MAXIMUM AND MINIMUM THERMOMETERS

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Indian Standard

SPECIFICATION FOR GENERAL PURPOSE MAXIMUM AND MINIMUM THERMOMETERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 June 1973, after the draft finalized by the Laboratory Glassware and Related Apparatus Sectional Committee, had been approved by the Chemical Division Council.

0.2 A general purpose maximum and minimum thermometer is generally used in educational institutions, industries, offices, green houses, etc, for registering extremes of temperature during a given period, usually 24 hours. It also acts as two thermometers each roughly indicating the dry bulb temperature of the ambient air. For more accurate work, however, use is made of two separate thermometers, that is, one indicating the maximum temperature and the other the minimum temperature during a given period (*see* IS: 5681-1970*).

0.3 The thermometer shown in Fig. 2 in this standard is based on publication No. IND/SL/5975 (a) 'Specification for thermometer, maximum and minimum, minus 35°C to 60°C', issued by the Ministry of Defence, Government of India. This pattern of thermometer has been incorporated in the standard with a view to meeting the defence requirements.

0.4 This standard contains clause 5.2 which calls for agreement between the purchaser and the supplier.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes requirements of general purpose maximum and minimum thermometers.

*Specification for general meteorological thermometers, liquid-in-glass.

†Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2627-1963* shall apply.

3. TYPES AND IMMERSION

3.1 General purpose maximum and minimum thermometer shall be of liquid-in-glass solid-stem type, calibrated for full vertical immersion.

4. REQUIREMENTS

4.1 Patterns — The thermometers shall be of two patterns, namely, Pattern A and Pattern B shown in Fig. 1 and 2 respectively.

4.2 Range — The range of thermometers conforming to Pattern A shall be -40° to $+60^{\circ}\text{C}$ with smallest scale divisions equivalent to 1.0°C . For thermometers conforming to Pattern B, this shall be -35° to $+60^{\circ}\text{C}$ with smallest scale divisions equivalent to 0.5°C .

4.3 Materials

4.3.1 Glass — The glass capillary used for the thermometer shall be in accordance with IS : 4610-1968†. The outer diameter of the capillary being 6.0 ± 0.5 mm.

4.3.2 Thermometric Liquid — Recommended thermometric liquid is either dyed or undyed alcohol or distilled creosote oil.

4.3.2.1 When alcohol is used it shall comply with the provisions of Special Grade of IS : 321-1964‡ subject to the following modifications:

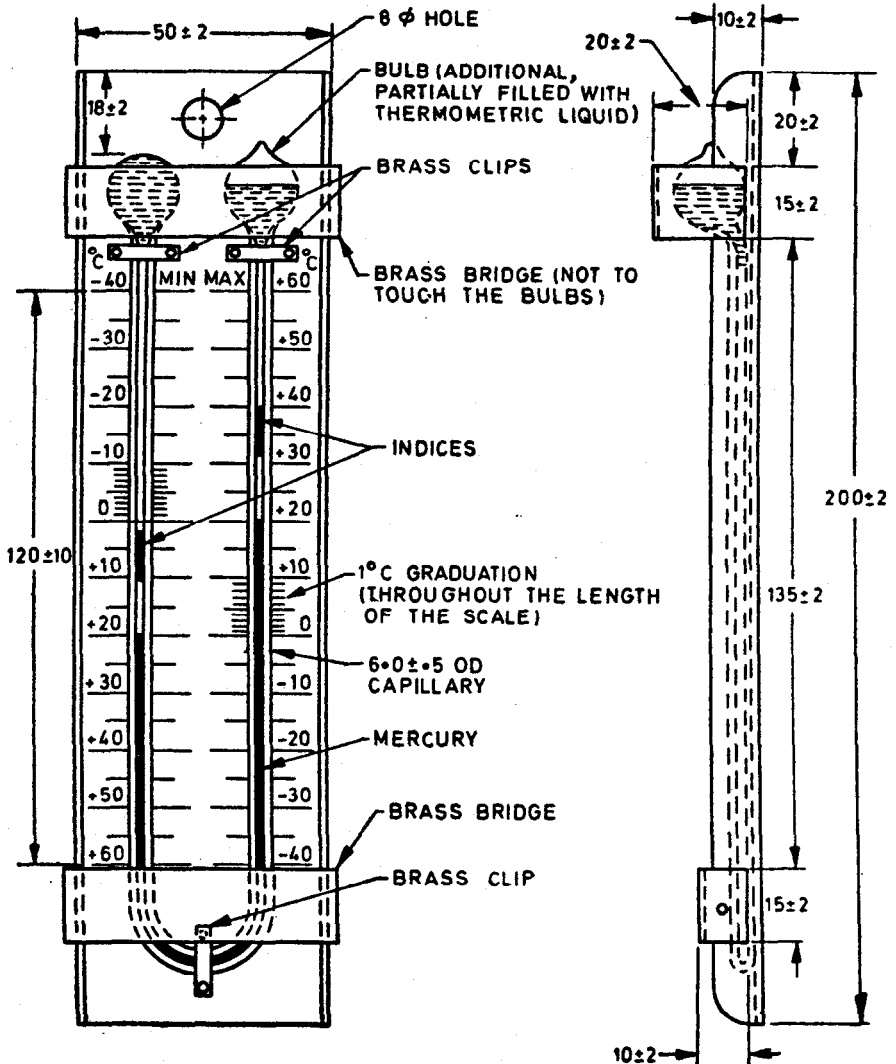
- a) *Aldehydes and ketones* — Alcohol shall not contain more than 0.02 percent (m/m) of aldehydes and ketones, calculated as acetaldehyde (CH_3CHO); and
- b) *Amines* — Alcohol shall give no indication of the presence of amines when tested by adding to 10 ml of alcohol, 10 ml of distilled water followed by 2 drops of a saturated solution of *p*-nitrophenol in water. Not more than 0.05 ml (1 drop) of 0.1 N sulphuric acid shall be required to discharge any yellow colour produced.

4.3.3 Separating Liquid — The liquid separating the two columns of the thermometric liquid in the two arms of the U-shaped capillary shall be pure and dry mercury which may be alloyed with 8.5 percent by mass of thallium.

*Glossary of terms relating to liquid-in-glass thermometers.

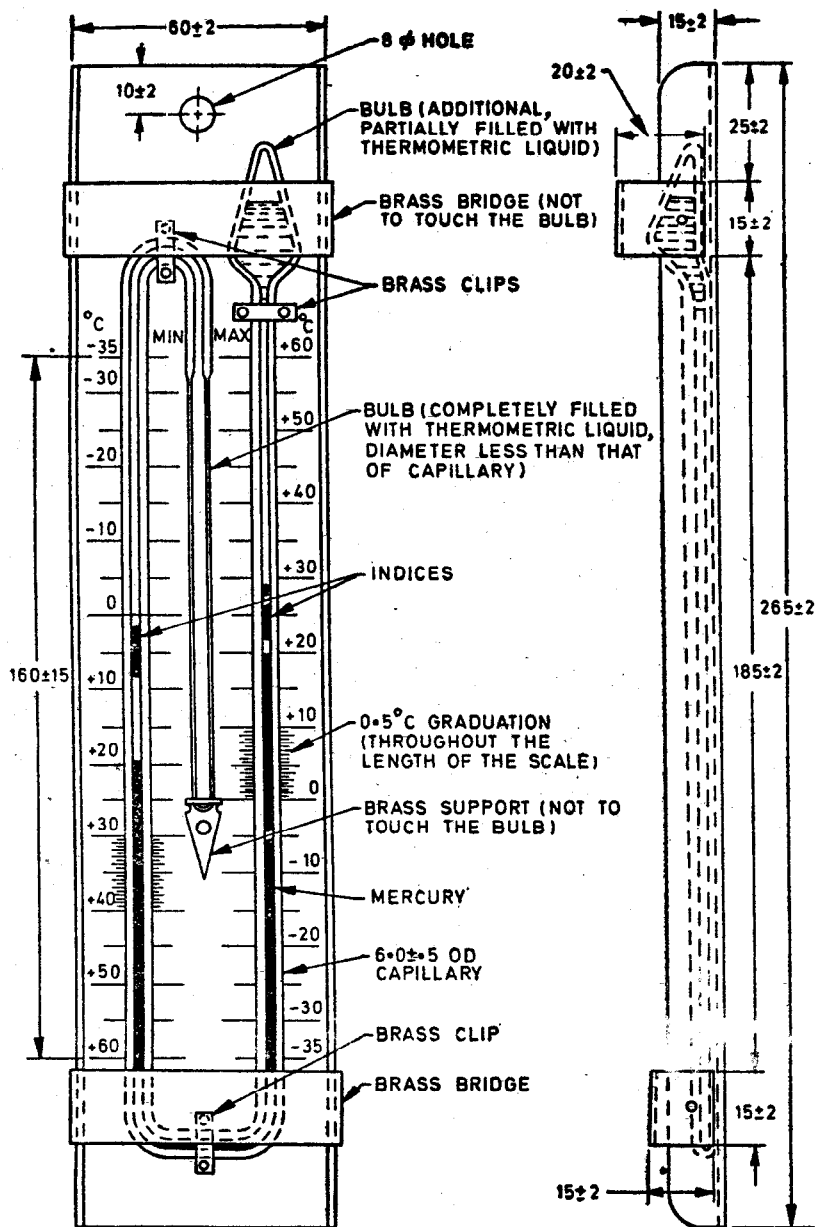
†Specification for glass tubes for general purpose and reference thermometers.

‡Specification for absolute alcohol (*revised*).



All dimensions in millimetres.

FIG. 1 GENERAL PURPOSE MAXIMUM AND MINIMUM THERMOMETER, PATTERN A



All dimensions in millimetres.

FIG. 2 GENERAL PURPOSE MAXIMUM AND MINIMUM THERMOMETER, PATTERN B

4.3.4 Indices — The indices shall be made of either steel spring or of dark coloured glass with attached spring.

4.3.5 Panel and Frame — The panel (portion bearing the scales) shall be of metal, opal glass or plastics material and shall be of suitable rigidity and thickness. If a plastics material is used, it shall be of a type known to be stable within the temperature range of the thermometer and shall be capable of withstanding exposure to outdoor weather conditions.

4.4 Workmanship and Finish — The thermometers shall consist of a U-shaped capillary with a bulb at each end (*see* Fig. 1 and 2). When fixed securely on the panel, the thermometer shall rest on it evenly without strain and there shall be no possibility of movement of its U-shaped portion relative to the graduated scales.

4.4.1 Bulbs — The two bulbs shall have shapes as shown in Fig. 1 and 2. In Pattern B, the outer diameter of the long bulb shall be less than that of the U-shaped capillary. The bulbs shall be fused to the capillary arms without any constriction to permit unrestricted flow of liquids and when the thermometer is fixed securely, the bulbs shall not touch the panel plate.

4.4.1.1 The bulb at left (*see* Fig. 1 and 2) shall be completely filled with thermometric liquid, that is, either alcohol or distilled creosote oil. The additional bulb on the right (*see* Fig. 1 and 2) shall be filled partially with the same thermometric liquid as in the bulb at left. It shall have sufficient volume to accommodate the thermometric liquid at the highest temperature, that is, $+ 60^{\circ}\text{C}$.

4.4.2 Capillary — The U-shaped glass capillary shall have a semicircular or square U-bend at the bottom (and also in the left arm in Pattern B). It shall have a mercury indicating column with registering indices in each arm. The portion above the mercury column in each arm shall be filled with the same thermometric liquid as in the bulbs.

4.4.3 Indices — The indices shall withstand reasonable handling of the thermometer without moving and shall be easily reset by means of a small magnet. They shall be so constructed that they shall be pushed up the capillary arms by the expanding mercury column, but shall remain in position without coming down when the mercury column recedes.

4.4.4 Panel and Frame — The panel may be carried in a frame either with or without a hinged hood for shading the bulbs of the thermometer. A suitable arrangement is shown in Fig. 1 and 2.

4.4.4.1 The panel (or the frame holding it) shall be provided with a suitable arrangement for hanging the assembly vertically on a wall.

4.5 Dimensions — The dimensions of the thermometers shall be as prescribed in Fig. 1 and 2.

4.5.1 In Fig. 1 dimensions other than the scale length, panel length and width are for guidance only.

4.6 Graduations and Figuring — The scales on the panel, along each limb of the U-shaped capillary tube shall be graduated at each 1° and 0.5°C interval for Patterns A and B respectively and numbered at each 10°C interval. Every graduation indicating a temperature equivalent to a multiple of five degrees shall be a medium line. The graduation lines shall extend on both sides of the limbs of the U-shaped capillary tube. The length of the small, medium and long graduation lines shall be 8, 10 and 12 mm respectively on either side of the capillary.

4.6.1 The figures indicating temperature shall be upright and shall be placed immediately above the graduations to which they refer. Alternatively, they may be placed so as to be bisected by the extension of the lines of graduation to which they refer.

4.7 Reference Line — The minimum side of the thermometer shall be engraved with a mark or line at 0°C mark which when placed against the corresponding graduation on the scale shall ensure proper placement of the U-shaped capillary tube along the scales.

4.8 Accuracy — When tested in accordance with the method prescribed in Appendix A, the maximum permissible errors in readings on each scale shall be equivalent to one smallest scale division, that is, 1°C for Pattern A and 0.5°C for Pattern B thermometers.

4.8.1 The maximum permissible difference between the reading on the scales at the meniscus of the mercury columns along the two limbs shall be equivalent to 0.5°C for Pattern A and 0.25°C for Pattern B thermometers.

5. MARKING AND PACKING

5.1 Marking — The following inscriptions shall be permanently and legibly marked on the panel of each thermometer:

- a) The inscription ' $^{\circ}\text{C}$ ' near the top of the respective scales;
- b) The words 'Max' and 'Min' along the respective scales;
- c) Letters 'Pattern A' or 'Pattern B', as the case may be;
- d) Maker's name or recognized trade-mark, if any; and
- e) The serial number.

5.1.1 The thermometers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements

of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5.2 Packing — The maximum and minimum thermometers shall be packed as agreed to between the purchaser and the supplier.

6. TESTING AND INSPECTION

6.1 All the thermometers shall be tested individually for conformity to the requirements of this specification.

APPENDIX A

(Clause 4.8)

TEST FOR ACCURACY

A-0. GENERAL

A-0.1 Accuracy of general purpose maximum and minimum thermometers is checked at the ice-point and room temperature.

A-1. APPARATUS

A-1.1 Ice-Point Equipment — same as prescribed in 5.1.1 of IS : 6274-1971*.

A-1.2 Reference Thermometers — two (see schedule marks 21 and 23 of IS : 4825-1968†).

A-2. PROCEDURE

A-2.1 Accuracy at Ice-Point — Prepare the ice-point equipment following the procedure prescribed in Appendix B of IS : 6274-1971* and when ready, place the assembled thermometer along side the reference thermometer (schedule mark 21 of IS : 4825-1968†) in it in a vertical position so that the bulbs and the U-shaped capillary are completely covered under shaved ice. After some time, when the temperature has become stationary, take out the thermometer and note the reading on the minimum side of the scales

*Method of calibrating liquid-in-glass thermometers.

†Specification for laboratory and reference thermometers.

and compare it with that of the reference thermometer and find out the difference.

A-2.1.1 Also note the difference, if any, between the readings on the two arms of the U-shaped capillary.

A-2.2 Accuracy at Room Temperature — Adjust the indices in both the scales along the U-shaped capillary to touch the mercury column, note the temperatures indicated on both sides.

A-2.2.1 Compare the temperature indicated by the minimum side with that of a reference thermometer (schedule mark 23 of IS : 4825-1968*) and find out the difference. Also note the difference, if any, between the readings on the two scales along the U-shaped capillary.

*Specification for laboratory and reference thermometers.